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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/086,652	02/28/2002	William R. Ashurst	02307V-121600US	6884
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TOWNSEND AND TOWNSEND AND CREW, LLP TWO EMBARCADERO CENTER EIGHTH FLOOR SAN FRANCISCO, CA 94111-3834			EXAMINER MARKHAM, WESLEY D	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 06/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/086,652

Applicant(s)

ASHURST ET AL.

Examiner

Wesley D Markham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 9-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 9-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

1. Acknowledgement is made of the amendment filed by the applicant on 3/12/2004, in which Claims 1, 9, and 10 were amended, Claims 7 and 8 were canceled, and Claims 19 – 21 were added. **Claims 1 – 6 and 9 – 21** are currently pending in U.S. Application Serial No. 10/086,652, and an Office Action on the merits follows.

### ***Specification***

2. The objection to the specification, set forth in paragraph 5 of the previous Office Action (i.e., the non-final Office Action mailed on 11/14/2003), is withdrawn in light of the applicant's REMARKS of 3/12/2004, in which the applicant specifically pointed out where in the specification the antecedent basis for Claims 9 and 10 is found (see page 5 of the response filed on 3/12/2004).

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. The rejection of Claims 9 and 10 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, set forth in paragraph 8 of the previous

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Office Action, is withdrawn in light of the applicant's amendment correcting the antecedent basis inconsistencies in the aforementioned claims.

***Claim Rejections - 35 USC § 102***

5. The 35 U.S.C. 102 rejections based on Leung et al. (USPN 6,576,489 B2), Patnode (USPN 2,306,222), and Frey et al. (USPN 4,274,856), set forth in paragraphs 10 – 15 of the previous Office Action, are withdrawn in light of the applicant's amendment in which independent Claim 1 was amended and narrowed in a manner such that none of the aforementioned references teaches each and every limitation of the claims.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order

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for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1 – 6, 9, 10, and 13 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leung et al. (USPN 6,576,489 B2) in view of Mayer et al. ("Chemical vapor deposition of fluoroalkylsilane monolayer films for adhesion control in microelectromechanical systems", Sept/Oct 2000).
9. Regarding independent **Claim 1** (from which Claims 2 – 21 depend), Leung et al. teaches a method for applying a silane coating to a surface that is at least partially wettable by water, the method comprising exposing the surface to a vapor-phase dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane under conditions resulting in the formation of a monolayer coating on the surface (Abstract, Figure 4, Col.1, lines 34 – 40, Col.2, lines 24 – 26 and 38 – 59, Col.3, lines 1 – 5 and 46 – 67, Col.4, lines 46 – 67, Col.5, lines 32 – 37 and 66 – 67, and Col.6, lines 1 – 52). Leung et al. also teaches that the exposure is performed in a non-oxidizing atmosphere (Col.5, lines 32 – 49). Leung et al. does not explicitly teach that the exposure is performed at a total pressure of 10<sup>-12</sup> torr to 100 torr. However, Leung et al. does teach that the pressure in the reaction chamber (i.e., the total pressure) should be below atmospheric pressure (i.e., below 760 torr, a range that encompasses the applicant's claimed range) but sufficiently high to have a suitable amount of alkylsilane-containing molecules present for expeditious formation of the coating (Col.6, lines 21 – 25). In other words, Leung et al. teaches that the pressure is a result / effective variable that should be kept below

atmospheric pressure and determines the speed at which the coating is formed (i.e., a higher pressure leads to a more expeditious (i.e., faster) formation of the coating). Therefore, it would have been obvious to one of ordinary skill in the art to optimize the total pressure in the process of Leung et al. as a result / effective variable through routine experimentation in order to achieve a desirably high deposition rate while maintaining the pressure below atmospheric pressure (i.e., below 760 torr), as taught by Leung et al. Additionally, Leung et al. does not explicitly teach exposing the surface to water vapor while exposing the surface to the silane compound, particularly exposing the surface to a gaseous mixture consisting of a dichlorodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane, water vapor, and an inert gas (**Claim 9**), more particularly exposing the surface to a gaseous mixture consisting of DCDMS, water vapor, and molecular nitrogen (**Claim 10**). Specifically, Leung et al. teaches exposing the surface to a gaseous mixture consisting of DCDMS and molecular nitrogen (N<sub>2</sub>) as an inert gas, but teaches that such exposure is performed in the absence of water (Col.5, lines 32 – 49 and 66 – 67, and Col.6, lines 1 – 31). In other words, the difference between applicant's claims and the process of Leung et al. is the inclusion of water vapor in the gaseous mixture. Mayer et al. teaches a similar process of vapor-depositing a monolayer, hydrophobic coating on the surface of a MEMS device (Abstract). Additionally, Mayer et al. teaches that the deposition process can be improved by adding water vapor to the gaseous chlorosilane precursor mixture (i.e., because the chlorosilanes do not rapidly react with surface hydroxyl groups to form a coating in the absence of the water vapor) (page 2436, section B., paragraph 2). Therefore, it

would have been obvious to one of ordinary skill in the art to add water vapor to the gaseous mixture of Leung et al. with the reasonable expectation of successfully and advantageously improving the deposition process (i.e., forming a stable film), as taught by Mayer et al. Leung et al. does not explicitly teach that the exposure conditions result in the bonding of di(C<sub>1</sub>-C<sub>3</sub> alkyl)silyloxy groups to the surface. However, the "conditions" of the process of Leung et al., including (1) the specific vapor-phase silane compound utilized, (2) the specific substrate / surface material treated, and (3) the process temperature are the same as the applicant's claimed and disclosed process "conditions". Therefore, unless essential process steps and/or limitations are missing from the applicant's claims, the process of the combination of Leung et al. and Mayer et al. would have inherently resulted in the bonding of di(C<sub>1</sub>-C<sub>3</sub> alkyl)silyloxy groups to the surface because the process conditions of Leung et al. are the same as the applicant's process conditions. Regarding **Claims 2 and 3**, Leung et al. also teaches that the dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane is a dichlorodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane (Claim 2), specifically dichlorodimethylsilane (i.e., DCDMS) (Claim 3) (Col.6, line 5). Regarding **Claims 5, 6, and 19 – 21**, Leung et al. also teaches that the surface is a polycrystalline silicon (i.e., polysilicon) semiconductive surface that has been oxidized by exposing the surface to OH (i.e., hydroxyl) radicals (i.e., that the surface is hydroxyl-terminated (poly)silicon, a surface having exposed hydroxyl groups) (Col.1, lines 34 – 40, Col.2, lines 49 – 55, Col.4, lines 46 – 64, and Col.6, lines 5 – 11). This oxidized / hydroxyl-terminated polysilicon surface is considered to be "hydrophilic", as required by applicant's **Claim 4** (see, for example, page 5, lines

20 – 25, of the applicant's specification). Regarding **Claims 13 and 14**, the combination of Leung et al. and Mayer et al. does not explicitly teach a method wherein the exposure is performed at a total pressure of from about 0.1 to about 15 torr (Claim 13), particularly from about 1 torr to about 5 torr (Claim 14). However, Leung et al. does teach that the pressure in the reaction chamber (i.e., the total pressure) should be below atmospheric pressure (i.e., below 760 torr) but sufficiently high to have a suitable amount of alkylsilane-containing molecules present for expeditious formation of the coating (Col.6, lines 21 – 25). In other words, Leung et al. teaches that the pressure is a result / effective variable that should be kept below atmospheric pressure and determines the speed at which the coating is formed (i.e., a higher pressure leads to a more expeditious (i.e., faster) formation of the coating). Therefore, it would have been obvious to one of ordinary skill in the art to optimize the total pressure in the process of Leung et al. as a result / effective variable through routine experimentation in order to achieve a desirably high deposition rate while maintaining the pressure below atmospheric pressure (i.e., below 760 torr, a range that encompasses the applicant's claimed ranges), as taught by Leung et al. Regarding **Claims 15 and 16**, Leung et al. also teaches that the exposure is performed at a temperature of from about 0°C to about 85°C (Claim 15), specifically at a temperature of from about 15°C to about 50°C (Claim 16) (Col.6, lines 19 – 21). Regarding **Claims 17 and 18**, Leung et al. does not explicitly teach a method wherein the exposure is performed for a continuous exposure time of from about 3 minutes to about 30 minutes (Claim 17), particularly from about 10 minutes to about



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20 minutes (Claim 18). However, Leung et al. does teach that parameters such as the treatment time are preferably adjusted to form a uniform monolayer across the surfaces of the substrate (Col.6, lines 25 – 28). Mayer et al. teaches a similar process of vapor-depositing a monolayer, hydrophobic coating on the surface of a MEMS device (Abstract). Further, Mayer et al. teaches that an exposure time of 15 minutes is sufficient to deposit a monolayer coating and that the growth rate slows dramatically after 15 minutes (page 2436, section B., paragraph 2). Therefore, it would have been obvious to one of ordinary skill in the art to perform the exposure / deposition process of Leung et al. continuously for a period of time of, for example, 15 minutes (as taught by Mayer et al.) in order to successfully deposit a monolayer film, as desired by Leung et al. In other words, one of ordinary skill in the art would have utilized a treatment time of 15 minutes because such a time is taught to be sufficient for forming a monolayer film, which is desired by Leung et al.

10. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leung et al. (USPN 6,576,489 B2) in view of Mayer et al., in further view of Breen et al. (US 2002/0172895 A1).

11. The combination of Leung et al. and Mayer et al. teaches all the limitations of **Claims 11 and 12** as set forth above in paragraph 9, except for a method wherein the vapor-phase dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane, specifically DCDMS, is at a partial pressure of from about 0.5 torr to about 5.0 torr (Claim 11), particularly about 1.0 to about 3.0 torr (Claim 12). Specifically, Leung et al. is silent as to the DCDMS partial

pressure, but teaches that a suitable amount of alkylsilane-containing molecules should be present for expeditious formation of the coating and that parameters such as the flow rate of the alkylsilane reagent should be adjusted to form a uniform monolayer on the surfaces (Col.6, lines 19 – 28). Additionally, Leung et al. teaches that the alkylsilane-containing molecule source can be heated to increase the vapor pressure (i.e., partial pressure) of the alkylsilane-containing molecules (Col.6, lines 28 – 31). In other words, Leung et al. teaches that the partial pressure of the silane compound can be controlled and/or regulated. Breen et al. teaches a similar method of vapor depositing a silane coating on a substrate (Abstract) and teaches that the partial pressure of the silane compound in the deposition chamber can be controlled by various process parameters (paragraph [0019]). It would have been obvious to one of ordinary skill in the art to optimize the partial pressure of the silane compound of Leung et al. with the reasonable expectation of (1) success, as both Leung et al. and Breen et al. teach that such partial pressure can be controlled / regulated, and (2) obtaining the benefits of optimizing the aforementioned partial pressure, such as providing a suitable amount of alkylsilane-containing molecules in the deposition chamber in order to expeditiously (i.e., quickly) form the coating.

12. Claims 1 – 5 and 13 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (USPN 6,190,003 B1).

13. Regarding independent **Claim 1**, Sato et al. teaches a method of applying a silane coating to a surface that is at least partially wettable by water, the method

comprising exposing the surface to a vapor-phase silane such as hexamethyldisilazane (HMDS) under conditions resulting in the deposition of a hydrophobic film (Abstract, Figure 6, Col.2, lines 44 – 63, Col.6, lines 9 – 26, Col.7, lines 30 – 52, and Col.9, lines 34 – 50). Sato et al. also teaches exposing the surface to water vapor while exposing the surface to the vapor-phase silane compound (Col.4, lines 14 – 19 and Col.7, lines 30 – 37). Additionally, Sato et al. does not make any mention or suggestion that the water vapor present in the exposure atmosphere oxidizes either the coating or the substrate, and therefore the environment of Sato et al. has been reasonably construed by the examiner to be “non-oxidizing”. The examiner’s position is in accordance with the applicant’s claims, in which it is clear an environment having water vapor therein is still considered to be “non-oxidizing” (see, for example, applicant’s Claim 1). Further, Sato et al. teaches that the exposure is performed at a vacuum of 10 torr or greater (i.e., at a total pressure of 10 torr or less) (Col.9, lines 48 – 49). This pressure falls within / overlaps the applicant’s claimed pressure range of  $10^{-12}$  torr to 100 torr. In the vapor-phase exposure embodiment, Sato et al. does not explicitly teach that the silane is a dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane. However, Sato et al. does teach that HMDS is only one member of a class of materials that can be utilized in accordance with the present invention, that the class of materials also includes DCDMS (i.e., a dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane), and that experiments have shown that the discussion regarding the HMDS species applies to the other members of the class in substantially the same way (Col.12, lines 27 – 46). Therefore, it would have been obvious to one of ordinary

skill in the art to utilize DCDMS in the process of Sato et al. instead of HMDS with the reasonable expectation of success and obtaining similar results (i.e., successfully depositing a hydrophobic silane film, as desired by Sato et al., regardless of whether HMDS or DCDMS is utilized as the precursor). Additionally, Sato et al. does not explicitly teach that the conditions result in the bonding of di(C<sub>1</sub>-C<sub>3</sub> alkyl)silyloxy groups to the surface. However, the "conditions" of the process of Sato et al., including (1) the specific vapor-phase silane compound utilized, (2) the specific substrate / surface material treated, (3) the process temperature, (4) the process pressure, and (5) the exposure time are the same as the applicant's claimed and disclosed process "conditions". Therefore, unless essential process steps and/or limitations are missing from the applicant's claims, the process of Sato et al. would have inherently resulted in the bonding of di(C<sub>1</sub>-C<sub>3</sub> alkyl)silyloxy groups to the surface because the process conditions of Sato et al. are the same as the applicant's process conditions. Regarding **Claims 2 and 3**, Sato et al. also teaches that the dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane is a dichlorodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane (Claim 2), specifically dichlorodimethylsilane (i.e., DCDMS) (Claim 3) (Col.12, lines 27 – 46). Regarding **Claims 4, 5, 19, and 20**, Sato et al. also teaches that the surface is a hydroxyl-terminated silicon surface, which has been reasonably construed by the examiner to be a "hydrophilic surface" (Figure 6 and Col.7, lines 48 – 52). Regarding **Claims 13 and 14**, Sato et al. teaches that the exposure is performed at a vacuum of 10 torr or greater (i.e., at a total pressure of 10 torr or less) (Col.9, lines 48 – 49). This pressure falls within / overlaps the applicant's claimed pressure range(s).

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Regarding **Claims 15 and 16**, Sato et al. teaches an exposure temperature of, for example, 20°C (Col.9, line 48), which falls within the applicant's claimed temperature range. Regarding **Claims 17 and 18**, Sato et al. teaches a continuous exposure time of between approximately 5 and 150 minutes (Col.9, lines 48 – 49). This exposure time falls within / overlaps the applicant's claimed range of time periods. Please note that overlapping ranges are *prima facie* obvious.

14. Claims 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Sato et al. (USPN 6,190,003 B1) in view of Leung et al. (USPN 6,576,489 B2).

15. Sato et al. teaches all the limitations of **Claims 6 and 21** as set forth above in

paragraph 13, except for a method wherein the surface is hydroxyl-terminated

polysilicon. However, Sato et al. does teach that the surface is hydroxyl-terminated

silicon in general (Figure 6 and Col.7, lines 49 – 52). Leung et al. teaches that silane

coatings such as those deposited on the surface of Sato et al. can be deposited on

either polycrystalline silicon (i.e., polysilicon) or amorphous silicon structures

(Abstract and Col.1, lines 34 – 40). Therefore, it would have been obvious to one of

ordinary skill in the art to perform the process of Sato et al. specifically on a

hydroxyl-terminated polysilicon surface (i.e., as opposed to a hydroxyl-terminated

silicon surface in general) with the reasonable expectation of success and obtaining

similar results, regardless of whether the silicon surface of Sato et al. is

polycrystalline or amorphous.

***Response to Arguments / Declaration under 37 CFR 1.131***

16. Applicant's arguments filed on 3/12/2004 have been fully considered but they are not persuasive.

17. First, the applicant argues that the Leung et al. patent (effective date of 5/7/2001) and the Breen et al. patent publication (effective date of 5/16/2001) should be removed from consideration as prior art in view of the 37 CFR 1.131 declaration of Mr. William Ashurst, one of the joint inventors of the instant application. The declaration of Mr. Ashurst includes Exhibit A (a drawing with various notations) and Exhibit B (a notebook entry purporting to show various materials and processing conditions), along with a statement by Mr. Ashurst that the Exhibits (completed prior to 5/7/2001) describe coating procedures and materials that fall within the scope of Claim 1 of the instant application. However, the declaration filed on 3/12/2004 under 37 CFR 1.131 has been considered but is ineffective to overcome either the Leung et al. reference or the Breen et al. reference. Specifically, the evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of either reference. For example, while Exhibit A appears to show some sort of apparatus, there is no description of the process (either specifically or in general) carried out using the aforementioned apparatus. Regarding Exhibit B, the notebook entry appears to show various materials and processing conditions, but no discussion or description of the claimed process is either shown or implied. Specifically, the presently claimed process requires applying a silane coating to a surface that is at least partially

wettable by water by exposing the surface to a vapor phase dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane) and water vapor, in a non-oxidizing atmosphere at a total pressure of 10<sup>-12</sup> torr to 100 torr, under conditions resulting in the bonding of specific silyloxy groups to the surface. None of the specifics of the claimed process are shown in the declaration / Exhibits, and the applicant's Exhibits simply do not show, either explicitly, implicitly, or inherently, that the claimed invention / process was reduced to practice prior to 5/7/2001. Additionally, even if a single embodiment of the claimed invention was shown in the aforementioned declaration, the scope of the declaration is certainly not commensurate with the scope of the claims, which are open to a broad genus of substrate surfaces, vapor phase silane compounds, and process pressures.

18. The applicant also argues that (1) Leung et al. teaches that water vapor is excluded from the reaction chamber and process during the deposition, a teaching that is in opposition to the claims of the instant application, which require water vapor to be present, and (2) the Mayer et al. paper, on its own, is far removed from the present invention, since the alkylsilane used by Mayer et al. is FOTS. In response to the applicant's arguments against the references (i.e., Leung et al. and Mayer et al.) individually, one cannot show non-obviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, the examiner agrees that Leung et al. does not explicitly teach exposing the surface to water vapor while exposing the surface to

the silane compound. Specifically, Leung et al. teaches exposing the surface to a gaseous mixture consisting of DCDMS and molecular nitrogen ( $N_2$ ) as an inert gas, but teaches that such exposure is performed in the absence of water (Col.5, lines 32 – 49 and 66 – 67, and Col.6, lines 1 – 31). In other words, the difference between applicant's claims and the process of Leung et al. is the inclusion of water vapor in the gaseous mixture. Mayer et al. teaches a similar process of vapor-depositing a monolayer, hydrophobic coating on the surface of a MEMS device (Abstract). Additionally, Mayer et al. teaches that the deposition process can be improved by adding water vapor to the gaseous chlorosilane precursor mixture (i.e., because the chlorosilanes do not rapidly react with surface hydroxyl groups to form a coating in the absence of the water vapor) (page 2436, section B., paragraph 2). As such, one of ordinary skill in the art would have been motivated to add water vapor to the gaseous mixture of Leung et al. with the reasonable expectation of successfully and advantageously improving the deposition process (i.e., forming a stable film), as taught by Mayer et al.

19. Regarding Sato et al., the applicant argues that the disclosure of Sato et al. focuses entirely on an alkylsilane (HMDS) that is chemically distinct from the dihalodialkylsilanes of the applicant's invention, and that, while DCDMS is briefly mentioned, there is no supporting explanation of how it could be applied and what advantages or disadvantages it might offer. In response, the examiner disagrees with the applicant's assessment. Sato et al. explicitly teaches that HMDS is only one member of a class of materials that can be utilized in accordance with the present



invention, that the class of materials also includes DCDMS (i.e., a dihalodi(C<sub>1</sub>-C<sub>3</sub> alkyl)silane), and that experiments have shown that the discussion regarding the HMDS species applies to the other members of the class in substantially the same way (Col.12, lines 27 – 46). As such, one of ordinary skill in the art would have been motivated to utilize DCDMS in the same way (e.g., method of application, process conditions, etc.) as HMDS in order to produce the hydrophobic film desired by Sato et al. The applicant also argues that the deposition in Sato et al. is performed in air at atmospheric pressure, and requires 20 hours of exposure time, while the applicant's claimed process, by contrast, is performed in a non-oxidizing atmosphere and at a pressure well under atmospheric pressure. In response, one embodiment of Sato et al. is performed in air at atmospheric pressure, and requires 20 hours of exposure time, as stated by the applicant. However, Sato et al. also teaches that the process is not limited to such an embodiment and can be performed for a period between 5 and 150 minutes at a vacuum of 10 Torr or greater (Col.9, lines 34 – 50). Therefore, the process of Sato et al. and the applicant's claimed process are not "clearly two different processes", as asserted by the applicant, and the applicant's statement that nothing in Sato et al. suggests that effective deposition can be achieved in such a short period of time (e.g., ten minutes) is inaccurate.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Miyashita et al. (JP 06-340966 A) teaches vapor depositing

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DCDMS under a vacuum onto the surface of a SiO<sub>2</sub> coated lens to form an organic coating film having excellent water-repellent properties. Murphy et al. (US 2002/0064663 A1) teaches forming a hydrophobic coating on a substrate by vapor depositing various silanes, including DCDMS. Robbart (USPN 4,554,215) teaches exposing a cellulose web to silane (e.g., DCDMS) vapors in the presence of moisture in order to react with hydroxyl groups in the cellulose and chemically modify the web.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham  
Examiner  
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